



## Selected Acquisition Report (SAR)

RCS: DD-A&T(Q&A)823-444



### SSBN 826 COLUMBIA Class Submarine (SSBN 826)

As of FY 2019 President's Budget

Defense Acquisition Management  
Information Retrieval  
(DAMIR)

~~This document contains information that may be exempt from mandatory disclosure under the FOIA.~~

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## Sensitivity Originator

**Organization:** Naval Sea Systems Command Program Executive Officer Submarines (PEO SUB)  
**Organization Email:**  
**Organization Phone:** 202-781-5225

## Common Acronyms and Abbreviations for MDAP Programs

Acq O&M - Acquisition-Related Operations and Maintenance  
ACAT - Acquisition Category  
ADM - Acquisition Decision Memorandum  
APB - Acquisition Program Baseline  
APPN - Appropriation  
APUC - Average Procurement Unit Cost  
\$B - Billions of Dollars  
BA - Budget Authority/Budget Activity  
Blk - Block  
BY - Base Year  
CAPE - Cost Assessment and Program Evaluation  
CARD - Cost Analysis Requirements Description  
CDD - Capability Development Document  
CLIN - Contract Line Item Number  
CPD - Capability Production Document  
CY - Calendar Year  
DAB - Defense Acquisition Board  
DAE - Defense Acquisition Executive  
DAMIR - Defense Acquisition Management Information Retrieval  
DoD - Department of Defense  
DSN - Defense Switched Network  
EMD - Engineering and Manufacturing Development  
EVM - Earned Value Management  
FOC - Full Operational Capability  
FMS - Foreign Military Sales  
FRP - Full Rate Production  
FY - Fiscal Year  
FYDP - Future Years Defense Program  
ICE - Independent Cost Estimate  
IOC - Initial Operational Capability  
Inc - Increment  
JROC - Joint Requirements Oversight Council  
\$K - Thousands of Dollars  
KPP - Key Performance Parameter  
LRIP - Low Rate Initial Production  
\$M - Millions of Dollars  
MDA - Milestone Decision Authority  
MDAP - Major Defense Acquisition Program  
MILCON - Military Construction  
N/A - Not Applicable  
O&M - Operations and Maintenance  
ORD - Operational Requirements Document  
OSD - Office of the Secretary of Defense  
O&S - Operating and Support  
PAUC - Program Acquisition Unit Cost

PB - President's Budget  
PE - Program Element  
PEO - Program Executive Officer  
PM - Program Manager  
POE - Program Office Estimate  
RDT&E - Research, Development, Test, and Evaluation  
SAR - Selected Acquisition Report  
SCP - Service Cost Position  
TBD - To Be Determined  
TY - Then Year  
UCR - Unit Cost Reporting  
U.S. - United States  
USD(AT&L) - Under Secretary of Defense (Acquisition, Technology and Logistics)

## Program Information

**Program Name**

SSBN 826 COLUMBIA Class Submarine (SSBN 826)

**DoD Component**

Navy

## Responsible Office

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**DSN Phone:** 326-2582

**DSN Fax:**

**Date Assigned:** May 26, 2015

## References

### **SAR Baseline (Development Estimate)**

Under Secretary of Defense (Acquisition, Technology & Logistics) Approved Acquisition Program Baseline (APB) dated January 04, 2017

### **Approved APB**

Under Secretary of Defense (Acquisition, Technology & Logistics) Approved Acquisition Program Baseline (APB) dated January 4, 2017

## **Mission and Description**

The COLUMBIA Class Submarine Program (SSBN 826) will design and construct a replacement for the OHIO Class Fleet Ballistic Missile Submarines (SSBN) which begin retiring in 2027 at a rate of one per year. The program goals are to provide an affordable platform capable of executing the strategic mission while remaining survivable through 2080. The mission of the COLUMBIA Class Submarine is strategic deterrence which will be enabled through the integration and deployment of the TRIDENT II D5 Life Extended Strategic Weapon System (SWS) on a new submarine class that satisfies the Sea Based Strategic Deterrent Initial Capabilities Document and Chief of Naval Operations approved Capabilities Development Document attributes.



## Executive Summary

### Program Highlights Since Last Report

The SSBN 826 successfully accomplished Milestone B on January 4, 2017. This decision authorized the SSBN 826 to enter into the EMD Phase, permitting the transition from preliminary design to detail design for the Class. These twelve SSBN 826 SSBNs will achieve the same operational availability as today's fourteen OHIO class SSBNs continuing to meet U.S. Strategic Command requirements. The life-of-ship reactor core reduces the span of the mid-life overhaul allowing for two fewer ships, which saves \$40B TY over the life of the class.

Held biannual Component Development Reviews with Electric Boat regarding the status of engineered components.

Held a series of Propulsor Production Readiness Reviews throughout the year for concurrent SSN 774 and SSBN 826 propulsor manufacturing at the Naval Foundry and Propeller Center.

Completed Super Module 1 Phase 2 Manufacturing Assembly Plan Review (January 2017).

Conducted the Strategic Weapons System (SWS) Fire Control Phase 2 System and Subsystem Preliminary Design Review (January 2017).

Completed Critical Design Review for the Advanced Carbon Dioxide Removal Unit (February 2017).

Conducted the SWS Operational Safety Review (March 2017).

Completed propulsor Large Scale Vehicle testing (Trial 1) (March 2017).

Completed propulsor hydrodynamic designs (April 2017).

Completed facility verification testing of the Very Large Test Apparatus at the Large Cavitation Channel using SSN 774 Class propulsor design (April 2017).

Commenced propulsor mechanical designs (May 2017).

Completed Super Module 1 Phase 2 final assembly and test (June 2017).

Commenced Launcher Evaluation Test Series at the Launch Test Facility in China Lake (June 2017).

Conducted the first joint cybersecurity Developmental Test event (pilot) sponsored jointly by PMS 450 and PMS 397 (July 24-28, 2017).

Commenced Operational Test-Bravo 1 (Early Operational Assessment) (August 2017).

Held MILCON and Training Sustainment Deep Dive at Kings Bay (August 2017).

Completed Hull Mechanical & Engineering/Common Missile Compartment engineered component procurement specifications (September 2017).

Completed delivery of the First Missile Tube at vendor BWX Technologies on August 30, 2017 and shipped to Electric Boat Quonset Point on September 25, 2017.

With the award of the Integrated Product and Process Development (IPPD) contract on September 21, 2017, the Navy has transitioned all design efforts from the OHIO Replacement Research & Development (R&D) Design contract to the IPPD contract.

Completed delivery of the second and third Missile Tubes from vendor BWX Technologies on October 19, 2017, and

December 9, 2017 respectively.

Completed detailed design of the Emergency Main Ballast Tank Blow Muffler and Air Turbine Pump (October 2017).

Conducted the SWS Fire Control Phase II Critical Design Review (November 7-8,2017).

Quick Disconnect Duct demonstration (November 2017).

Started installation of upgraded acoustic arrays at the Naval Surface Warfare Center Carderock Division's Acoustic Research Detachment and completed installation of one array. Second array installation anticipated to complete in early 2018 (October-December 2017).

Completed delivery of two United Kingdom Strategic Weapons Support Systems (SWSS) kits to UK Ministry of Defence (December 2017).

Arrangements 80% Completed (December 2017).

Compatibility Test Facility Integrated Power System testing commenced on schedule (December 2017).

PAUC/APUC changes since the December 2016 SAR submission were driven entirely by budget reductions with no new initiatives funded.

There are no significant software-related issues with this program at this time.

History of Significant Developments Since Program Initiation	
History of Significant Developments Since Program Initiation	
Date	Significant Development Description
July 2008	USD AT&L issues ADM directing entry into the Concept Refinement Phase and conduct of an Analysis of Alternatives.
October 2008	Secretary of Defense sends letter to United Kingdom (UK) Secretary of State for Defense to affirm the U.S.-UK Mutual Defense Agreement and cost sharing for the Common Missile Compartment.
September 2010	SCP approved with new design SSBN based on 12 ships with 16 - 87" missile tubes.
January 2011	Milestone A ADM issued which authorized entry into Technology Maturation and Risk Reduction (TMRR) phase to complete a new design SSBN based on 12 ships with 16 - 87" missile tubes.
February 2012	PB 2013 shifts lead ship construction from FY 2019 to FY 2021; the two year recapitalization delay removed all margin during the OHIO-OHIO Replacement (OR) transition period (FY 2027- FY2042), any delay in OR delivery or unexpected aging impact to OHIO will have significant impacts on SSBN Ao.
December 2012	RDT&E Design Contract issued to General Dynamics – Electric Boat.
December 2014	National Sea-Based Deterrence Fund established by Public Law 113-291.
November 2015	Incremental funding authority and authority to enter in contracts for Advance Construction and economic order quantity provided by Public Law 114-92.
January 2017	Milestone B APB approved (Program Initiation).
September 2017	Award of the Integrated Product and Process Development (IPPD) contract. The Navy has transitioned all design efforts from the OHIO Replacement Research & Development (R&D) Design contract to the IPPD contract.



## Threshold Breaches

### APB Breaches

<b>Schedule</b>		<input checked="" type="checkbox"/>
<b>Performance</b>		<input type="checkbox"/>
<b>Cost</b>	RDT&E	<input type="checkbox"/>
	Procurement	<input type="checkbox"/>
	MILCON	<input type="checkbox"/>
	Acq O&M	<input type="checkbox"/>
<b>O&amp;S Cost</b>		<input type="checkbox"/>
<b>Unit Cost</b>	PAUC	<input type="checkbox"/>
	APUC	<input type="checkbox"/>

### Explanation of Breach

The APB threshold for award of the Integrated Process and Product Development (IPPD) contract is July 2017.

The schedule breach was caused by the IPPD Contract Award current estimate changing from July 2017 to September 2017 due to the completion of contract negotiations in July and the contract award in September. The Navy utilized existing vehicles to ensure the design remained on track.

COLUMBIA Class submitted a Program Deviation Report and revised the APB to reflect the new date for the IPPD contract award.

### Nunn-McCurdy Breaches

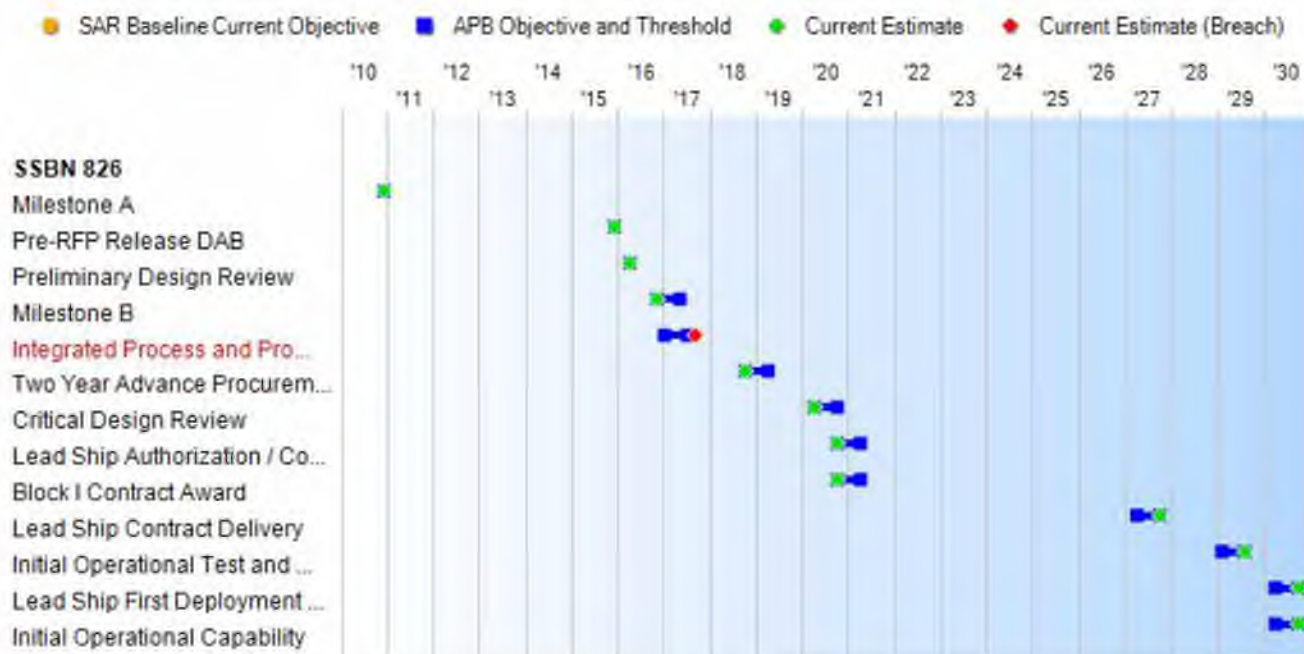
#### Current UCR Baseline

PAUC	None
APUC	None

#### Original UCR Baseline

PAUC	None
APUC	None

## Schedule



Schedule Events				
Events	SAR Baseline Development Estimate	Current APB Development Objective/Threshold	Current Estimate	
Milestone A	Dec 2010	Dec 2010	Dec 2010	Dec 2010
Pre-RFP Release DAB	Dec 2015	Dec 2015	Dec 2015	Dec 2015
Preliminary Design Review	Apr 2016	Apr 2016	Apr 2016	Apr 2016
Milestone B	Nov 2016	Nov 2016	May 2017	Nov 2016
Integrated Process and Product Development Contract Award	Jan 2017	Jan 2017	Jul 2017	<b>Sep 2017<sup>†</sup></b> (Ch-1)
Two Year Advance Procurement Funding Modification	Oct 2018	Oct 2018	Apr 2019	Oct 2018
Critical Design Review	Apr 2020	Apr 2020	Oct 2020	Apr 2020
Lead Ship Authorization / Construction Start	Oct 2020	Oct 2020	Apr 2021	Oct 2020
Block I Contract Award	Oct 2020	Oct 2020	Apr 2021	Oct 2020
Lead Ship Contract Delivery	Apr 2027	Apr 2027	Oct 2027	Oct 2027
Initial Operational Test and Evaluation Complete	Feb 2029	Feb 2029	Aug 2029	Aug 2029
Lead Ship First Deployment Start	Apr 2030	Apr 2030	Oct 2030	Oct 2030
Initial Operational Capability	Apr 2030	Apr 2030	Oct 2030	Oct 2030

<sup>†</sup> APB Breach

**Change Explanations**

(Ch-1) The Integrated Process and Product Development Contract Award current estimate changed from July 2017 to September 2017 due to the completion of contract negotiations in July and the contract award in September. The Navy utilized existing vehicles to ensure the design remained on track.



## Performance

Performance Characteristics				
SAR Baseline Development Estimate	Current APB Development Objective/Threshold		Demonstrated Performance	Current Estimate
Operations and Support (O&S) Cost KSA				
Average annual O&S cost per unit of \$96M (CY 2010\$)	Average annual O&S cost per unit of \$96M (CY 2010\$)	Average annual O&S cost per unit of \$108M (CY 2010\$)	TBD	The CDD was administratively updated and signed January 22, 2018 to reflect the Affordability caps set at Milestone B. Objective/Threshold was updated to \$119M (CY 2017 \$) and \$131M (CY2017\$) respectively. Current estimate is \$118.8M (CY2017 \$).
Net-Ready KPP				
Meet the requirements defined within the OR SSBN PIIT of the Common Submarine Information Support Plan	Meet the requirements defined within the OR SSBN PIIT of the Common Submarine Information Support Plan	(T=O) Meet the requirements defined within the OR SSBN PIIT of the Common Submarine Information Support Plan	TBD	Meet the requirements defined within the OR SSBN PIIT of the Common Submarine Information Support Plan
Training KPP				
OR SSBN crews are capable of being certified proficient for strategic patrol operations by the Group Commander upon completion of the normal PDTP in accordance with Fleet instructions	OR SSBN crews are capable of being certified proficient for strategic patrol operations by the Group Commander upon completion of the normal PDTP in accordance with Fleet instructions	(T=O) OR SSBN crews are capable of being certified proficient for strategic patrol operations by the Group Commander upon completion of the normal PDTP in accordance with Fleet instructions	TBD	OR SSBN crews are capable of being certified proficient for strategic patrol operations by the Group Commander upon completion of the normal PDTP in accordance with Fleet instructions
Space, Weight, Power, and Cooling (SWAP-C) KSA				
Future Growth Margin: 3% of Condition A-1 weight Cooling Capacity: 10% cooling capacity over the chill water design heat load Power – 10% electrical power future growth margin for	Future Growth Margin: 3% of Condition A-1 weight Cooling Capacity: 10% cooling capacity over the chill water design heat load Power – 10% electrical power	(T=O) Future Growth Margin: 3% of Condition A-1 weight Cooling Capacity: 10% cooling capacity over the chill water design heat load Power – 10% electrical power	TBD	Future Growth Margin: 3% of Condition A-1 weight Cooling Capacity: 10% cooling capacity over the chill water design heat load Power – 10% electrical power future growth margin for ship's electrical loads at full power while underway at delivery

ship's electrical loads at full power while underway at delivery	future growth margin for ship's electrical loads at full power while underway at delivery	future growth margin for ship's electrical loads at full power while underway at delivery		
<b>Procurement Cost KCP</b>				
Lead Ship End Cost Less Plans of \$6.3B (2010\$) using Navy Inflation / Deflation Indices Average Follow Ship Hulls 2-12 End Cost of \$4.9B (2010\$) using Navy Inflation / Deflation Indices	Lead Ship End Cost Less Plans of \$6.3B (CY 2010\$) using Navy Inflation / Deflation Indices Average Follow Ship Hulls 2-12 End Cost of \$4.9B (CY 2010\$) using Navy Inflation / Deflation Indices	Lead Ship End Cost Less Plans of \$6.8B (CY 2010\$) using Navy Inflation / Deflation Indices Average Follow Ship Hulls 2-12 End Cost of \$5.6B (CY 2010\$) using Navy Inflation / Deflation Indices	TBD	The CDD was administratively updated and signed January 22, 2018 to reflect the Affordability caps set at Milestone B. Average Procurement Unit Cost (APUC) Objective/Threshold was updated to \$7.3B (CY 2017\$) and \$8.0B (CY2017\$) respectively. Current estimate is \$7.25B (CY2017 \$).
<b>Lead Ship First Deployment Key Schedule Parameter</b>				
Third quarter of FY2030	Third quarter of FY 2030	First quarter of FY 2031	TBD	First quarter of FY 2031

Classified Performance information is provided in the classified annex to this submission.

#### Requirements Reference

CDD for the OHIO Replacement Submarine dated of August 25, 2015

#### Change Explanations

None

#### Acronyms and Abbreviations

KCP - Key Cost Parameter  
O - Objective  
PDTP - Pre-Deployment Training Plan  
PIIT - Platform Information Integration Table  
T - Threshold



## Track to Budget

### RDT&E

Appn	BA	PE	
Navy	1319	04	0603561N
	<b>Project</b>	<b>Name</b>	
	3220	Advanced Submarine System Development (Sunk)	
Navy	1319	04	0603570N
	<b>Project</b>	<b>Name</b>	
	3219	SBSD Nuclear Technology Development	
Navy	1319	04	0603595N
	<b>Project</b>	<b>Name</b>	
	3220	COLUMBIA Class Submarine Development	
	3237	Launch Test Facility (Sunk)	

### Procurement

Appn	BA	PE	
Navy	1611	01	0101221N
	<b>Line Item</b>	<b>Name</b>	
	1045	COLUMBIA Class Submarine	
Navy	1810	04	0101221N
	<b>Line Item</b>	<b>Name</b>	
	5358	Strategic Missile Systems Equipment (Shared)	

### MILCON

Appn	BA	PE	
Navy	1205	01	0703676N
	<b>Project</b>	<b>Name</b>	
	32414106	Submarine Propulsor Manufacturing Support Facility (Shared)	
Navy	1205	01	0703976N
	<b>Project</b>	<b>Name</b>	
	32414106	Submarine Propulsor Manufacturing Support Facility (Shared)	
Navy	1205	01	0805376N
	<b>Project</b>	<b>Name</b>	
	32414547	Ohio Replacement Power and Propulsion Facility (Sunk)	
Navy	1205	01	0805976N
	<b>Project</b>	<b>Name</b>	
	42237676	Trident Training Facility Phase I (Shared)	

Navy

1205 03 0901211N

Project	Name
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64482044 MCON Design Funds (Shared)

## Cost and Funding

### Cost Summary

Total Acquisition Cost							
Appropriation	BY 2017 \$M			BY 2017 \$M	TY \$M		
	SAR Baseline Development Estimate	Current APB Development Objective/Threshold		Current Estimate	SAR Baseline Development Estimate	Current APB Development Objective	Current Estimate
RDT&E	12648.1	12648.1	13912.9	12665.8	13020.3	13020.3	13020.3
Procurement	87426.5	87426.5	96169.2	87018.7	115044.3	115044.3	113667.6
Flyaway	--	--	--	85154.8	--	--	111214.8
Recurring	--	--	--	80181.6	--	--	105667.9
Non Recurring	--	--	--	4973.2	--	--	5546.9
Support	--	--	--	1863.9	--	--	2452.8
Other Support	--	--	--	1863.9	--	--	2452.8
Initial Spares	--	--	--	0.0	--	--	0.0
MILCON	147.3	147.3	162.0	157.7	173.4	173.4	186.9
Acq O&M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	100221.9	100221.9	N/A	99842.2	128238.0	128238.0	126874.8

#### Current APB Cost Estimate Reference

SCP dated September 26, 2016

#### Cost Notes

In accordance with Section 842 of the National Defense Authorization Act for FY 2017, which amended title 10 U.S.C. § 2334, the Director of Cost Assessment and Program Evaluation, and the Secretary of the military department concerned or the head of the Defense Agency concerned, must issue guidance requiring a discussion of risk, the potential impacts of risk on program costs, and approaches to mitigate risk in cost estimates for MDAPs and major subprograms. The information required by the guidance is to be reported in each SAR. This guidance is not yet available; therefore, the information on cost risk is not contained in this SAR.

Total Quantity			
Quantity	SAR Baseline Development Estimate	Current APB Development	Current Estimate
RDT&E	0	0	0
Procurement	12	12	12
Total	12	12	12



## Cost and Funding

### Funding Summary

Appropriation Summary									
FY 2019 President's Budget / December 2017 SAR (TY\$ M)									
Appropriation	Prior	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	To Complete	Total
RDT&E	7873.7	1099.6	739.9	587.3	393.5	256.2	230.5	1839.6	13020.3
Procurement	773.1	842.9	3005.3	1453.1	4214.6	4206.0	3884.0	95288.6	113667.6
MILCON	25.7	2.4	30.2	0.0	0.5	1.3	14.6	112.2	186.9
Acq O&M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PB 2019 Total	8672.5	1944.9	3775.4	2040.4	4608.6	4463.5	4129.1	97240.4	126874.8
PB 2018 Total	8690.7	1929.8	3794.1	2075.4	4644.5	4538.0	4203.6	97160.3	127036.4
Delta	-18.2	15.1	-18.7	-35.0	-35.9	-74.5	-74.5	80.1	-161.6

Quantity Summary										
FY 2019 President's Budget / December 2017 SAR (TY\$ M)										
Quantity	Undistributed	Prior	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	To Complete	Total
Development	0	0	0	0	0	0	0	0	0	0
Production	0	0	0	0	0	1	0	0	11	12
PB 2019 Total	0	0	0	0	0	1	0	0	11	12
PB 2018 Total	0	0	0	0	0	1	0	0	11	12
Delta	0	0	0	0	0	0	0	0	0	0

## Cost and Funding

### Annual Funding By Appropriation

Annual Funding							
1319   RDT&E   Research, Development, Test, and Evaluation, Navy							
Fiscal Year	Quantity	TY \$M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
2008	--	--	--	--	--	--	62.7
2009	--	--	--	--	--	--	140.3
2010	--	--	--	--	--	--	463.5
2011	--	--	--	--	--	--	627.3
2012	--	--	--	--	--	--	957.2
2013	--	--	--	--	--	--	727.4
2014	--	--	--	--	--	--	1125.2
2015	--	--	--	--	--	--	1256.6
2016	--	--	--	--	--	--	1367.0
2017	--	--	--	--	--	--	1071.5
2018	--	--	--	--	--	--	1041.6
2019	--	--	--	--	--	--	704.9
2020	--	--	--	--	--	--	547.3
2021	--	--	--	--	--	--	393.5
2022	--	--	--	--	--	--	256.2
2023	--	--	--	--	--	--	230.5
2024	--	--	--	--	--	--	249.2
2025	--	--	--	--	--	--	244.6
2026	--	--	--	--	--	--	245.8
2027	--	--	--	--	--	--	245.8
2028	--	--	--	--	--	--	245.8
2029	--	--	--	--	--	--	103.1
2030	--	--	--	--	--	--	94.7
2031	--	--	--	--	--	--	80.5
2032	--	--	--	--	--	--	80.1
2033	--	--	--	--	--	--	81.7
2034	--	--	--	--	--	--	83.3
2035	--	--	--	--	--	--	85.0
Subtotal	--	--	--	--	--	--	12812.3

Annual Funding							
1319   RDT&E   Research, Development, Test, and Evaluation, Navy							
Fiscal Year	Quantity	BY 2017 \$M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
2008	--	--	--	--	--	--	70.7
2009	--	--	--	--	--	--	156.1
2010	--	--	--	--	--	--	508.1
2011	--	--	--	--	--	--	671.6
2012	--	--	--	--	--	--	1008.1
2013	--	--	--	--	--	--	758.2
2014	--	--	--	--	--	--	1156.6
2015	--	--	--	--	--	--	1276.0
2016	--	--	--	--	--	--	1364.7
2017	--	--	--	--	--	--	1052.2
2018	--	--	--	--	--	--	1005.6
2019	--	--	--	--	--	--	668.0
2020	--	--	--	--	--	--	508.6
2021	--	--	--	--	--	--	358.5
2022	--	--	--	--	--	--	228.9
2023	--	--	--	--	--	--	201.9
2024	--	--	--	--	--	--	214.0
2025	--	--	--	--	--	--	205.9
2026	--	--	--	--	--	--	202.8
2027	--	--	--	--	--	--	198.9
2028	--	--	--	--	--	--	195.0
2029	--	--	--	--	--	--	80.2
2030	--	--	--	--	--	--	72.2
2031	--	--	--	--	--	--	60.2
2032	--	--	--	--	--	--	58.7
2033	--	--	--	--	--	--	58.7
2034	--	--	--	--	--	--	58.7
2035	--	--	--	--	--	--	58.7
Subtotal	--	--	--	--	--	--	12457.8

Annual Funding 9999   RDT&E   Non Treasury Funds							
Fiscal Year	Quantity	TY \$M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
2017	--	--	--	--	--	--	75.0
2018	--	--	--	--	--	--	58.0
2019	--	--	--	--	--	--	35.0
2020	--	--	--	--	--	--	40.0
Subtotal	--	--	--	--	--	--	208.0



Annual Funding 9999   RDT&E   Non Treasury Funds							
Fiscal Year	Quantity	BY 2017 \$M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
2017	--	--	--	--	--	--	75.0
2018	--	--	--	--	--	--	58.0
2019	--	--	--	--	--	--	35.0
2020	--	--	--	--	--	--	40.0
Subtotal	--	--	--	--	--	--	208.0



Annual Funding 1611   Procurement   Shipbuilding and Conversion, Navy							
Fiscal Year	Quantity	TY \$M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
2017	--	--	--	773.1	773.1	--	773.1
2018	--	115.1	--	727.8	842.9	--	842.9
2019	--	2319.7	--	685.6	3005.3	--	3005.3
2020	--	839.7	--	613.4	1453.1	--	1453.1
2021	1	3227.7	--	986.9	4214.6	--	4214.6
2022	--	3199.6	--	998.4	4198.0	--	4198.0
2023	--	3114.2	--	761.7	3875.9	--	3875.9
2024	1	4760.6	--	--	4760.6	0.6	4761.2
2025	--	6005.1	--	--	6005.1	29.1	6034.2
2026	1	8388.6	--	--	8388.6	10.9	8399.5
2027	1	8346.5	--	--	8346.5	46.0	8392.5
2028	1	8324.8	--	--	8324.8	10.0	8334.8
2029	1	8504.7	--	--	8504.7	45.4	8550.1
2030	1	8710.4	--	--	8710.4	33.1	8743.5
2031	1	8729.3	--	--	8729.3	51.9	8781.2
2032	1	8860.6	--	--	8860.6	49.7	8910.3
2033	1	7832.5	--	--	7832.5	51.9	7884.4
2034	1	6955.4	--	--	6955.4	52.0	7007.4
2035	1	6368.1	--	--	6368.1	52.2	6420.3
2036	--	161.2	--	--	161.2	52.7	213.9
2037	--	169.8	--	--	169.8	53.3	223.1
2038	--	188.5	--	--	188.5	53.6	242.1
2039	--	216.7	--	--	216.7	29.2	245.9
2040	--	77.2	--	--	77.2	20.8	98.0
2041	--	78.0	--	--	78.0	2.9	80.9
2042	--	173.9	--	--	173.9	2.3	176.2
Subtotal	12	105667.9	--	5546.9	111214.8	647.6	111862.4

Annual Funding 1611   Procurement   Shipbuilding and Conversion, Navy							
Fiscal Year	Quantity	BY 2017 \$M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
2017	--	--	--	736.1	736.1	--	736.1
2018	--	107.6	--	680.2	787.8	--	787.8
2019	--	2126.3	--	628.5	2754.8	--	2754.8
2020	--	754.6	--	551.3	1305.9	--	1305.9
2021	1	2843.9	--	869.5	3713.4	--	3713.4
2022	--	2763.8	--	862.5	3626.3	--	3626.3
2023	--	2637.3	--	645.1	3282.4	--	3282.4
2024	1	3952.6	--	--	3952.6	0.5	3953.1
2025	--	4888.1	--	--	4888.1	23.7	4911.8
2026	1	6694.3	--	--	6694.3	8.7	6703.0
2027	1	6530.1	--	--	6530.1	36.0	6566.1
2028	1	6385.4	--	--	6385.4	7.7	6393.1
2029	1	6395.5	--	--	6395.5	34.2	6429.7
2030	1	6421.8	--	--	6421.8	24.4	6446.2
2031	1	6309.5	--	--	6309.5	37.5	6347.0
2032	1	6278.8	--	--	6278.8	35.3	6314.1
2033	1	5441.5	--	--	5441.5	36.0	5477.5
2034	1	4737.4	--	--	4737.4	35.4	4772.8
2035	1	4252.3	--	--	4252.3	34.9	4287.2
2036	--	105.5	--	--	105.5	34.5	140.0
2037	--	109.0	--	--	109.0	34.2	143.2
2038	--	118.6	--	--	118.6	33.7	152.3
2039	--	133.7	--	--	133.7	18.0	151.7
2040	--	46.7	--	--	46.7	12.6	59.3
2041	--	46.2	--	--	46.2	1.8	48.0
2042	--	101.1	--	--	101.1	1.3	102.4
Subtotal	12	80181.6	--	4973.2	85154.8	450.4	85605.2

FY 2021 represents incremental funding of the COLUMBIA Class Submarine Lead Ship and assumes incremental funding of the first hull over FY 2021, FY 2022, FY 2023. Total end cost for the Lead ship is \$14.045B TY.

Cost Quantity Information		
1611   Procurement   Shipbuilding and Conversion, Navy		
Fiscal Year	Quantity	End Item Recurring Flyaway (Aligned With Quantity) BY 2017 \$M
2017	--	--
2018	--	--
2019	--	--
2020	--	--
2021	1	7728.4
2022	--	--
2023	--	--
2024	1	7572.8
2025	--	--
2026	1	6960.7
2027	1	6738.6
2028	1	6544.2
2029	1	6480.3
2030	1	6418.0
2031	1	6359.3
2032	1	6314.5
2033	1	6303.5
2034	1	6342.1
2035	1	6419.2
2036	--	--
2037	--	--
2038	--	--
2039	--	--
2040	--	--
2041	--	--
2042	--	--
Subtotal	12	80181.6



Annual Funding								
1810   Procurement   Other Procurement, Navy								
Fiscal Year	Quantity	TY \$M						
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program	
2022	--	--	--	--	--	8.0	8.0	
2023	--	--	--	--	--	8.1	8.1	
2024	--	--	--	--	--	260.1	260.1	
2025	--	--	--	--	--	--	--	
2026	--	--	--	--	--	320.0	320.0	
2027	--	--	--	--	--	27.6	27.6	
2028	--	--	--	--	--	280.3	280.3	
2029	--	--	--	--	--	489.9	489.9	
2030	--	--	--	--	--	84.2	84.2	
2031	--	--	--	--	--	--	--	
2032	--	--	--	--	--	--	--	
2033	--	--	--	--	--	162.1	162.1	
2034	--	--	--	--	--	164.9	164.9	
Subtotal	--	--	--	--	--	1805.2	1805.2	

Annual Funding								
1810   Procurement   Other Procurement, Navy								
Fiscal Year	Quantity	BY 2017 \$M						
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program	
2022	--	--	--	--	--	7.1	7.1	
2023	--	--	--	--	--	7.0	7.0	
2024	--	--	--	--	--	221.7	221.7	
2025	--	--	--	--	--	--	--	
2026	--	--	--	--	--	262.1	262.1	
2027	--	--	--	--	--	22.2	22.2	
2028	--	--	--	--	--	220.7	220.7	
2029	--	--	--	--	--	378.1	378.1	
2030	--	--	--	--	--	63.7	63.7	
2031	--	--	--	--	--	--	--	
2032	--	--	--	--	--	--	--	
2033	--	--	--	--	--	115.6	115.6	
2034	--	--	--	--	--	115.3	115.3	
Subtotal	--	--	--	--	--	1413.5	1413.5	

Annual Funding 1205   MILCON   Military Construction, Navy and Marine Corps		
Fiscal Year	TY \$M	
	Total Program	
2015	24.3	
2016	--	
2017	1.4	
2018	2.4	
2019	30.2	
2020	--	
2021	0.5	
2022	1.3	
2023	14.6	
2024	21.3	
2025	2.9	
2026	61.1	
2027	1.4	
2028	25.5	
Subtotal	186.9	

Annual Funding 1205   MILCON   Military Construction, Navy and Marine Corps		
Fiscal Year	BY 2017 \$M	
	Total Program	
2015		23.9
2016		--
2017		1.3
2018		2.2
2019		27.5
2020		--
2021		0.4
2022		1.1
2023		12.3
2024		17.6
2025		2.3
2026		48.5
2027		1.1
2028		19.5
Subtotal		157.7

Funding profile represents COLUMBIA Class Milestone B APB with the inclusion of PB 2019 controls, including Naval Foundry and Propeller Center requirements.



## Low Rate Initial Production

Item	Initial LRIP Decision	Current Total LRIP
<b>Approval Date</b>	1/4/2017	1/4/2017
<b>Approved Quantity</b>	12	12
<b>Reference</b>	Milestone B ADM	Milestone B ADM
<b>Start Year</b>	2021	2021
<b>End Year</b>	2035	2035

The Current Total LRIP Quantity is more than 10% of the total production quantity in accordance with the Milestone B ADM approved January 4, 2017, which approved a LRIP quantity of 12, which is the total buy necessary due to the earliest date at which Operational Test and Evaluation could be conducted on the lead ship.

## Foreign Military Sales

None

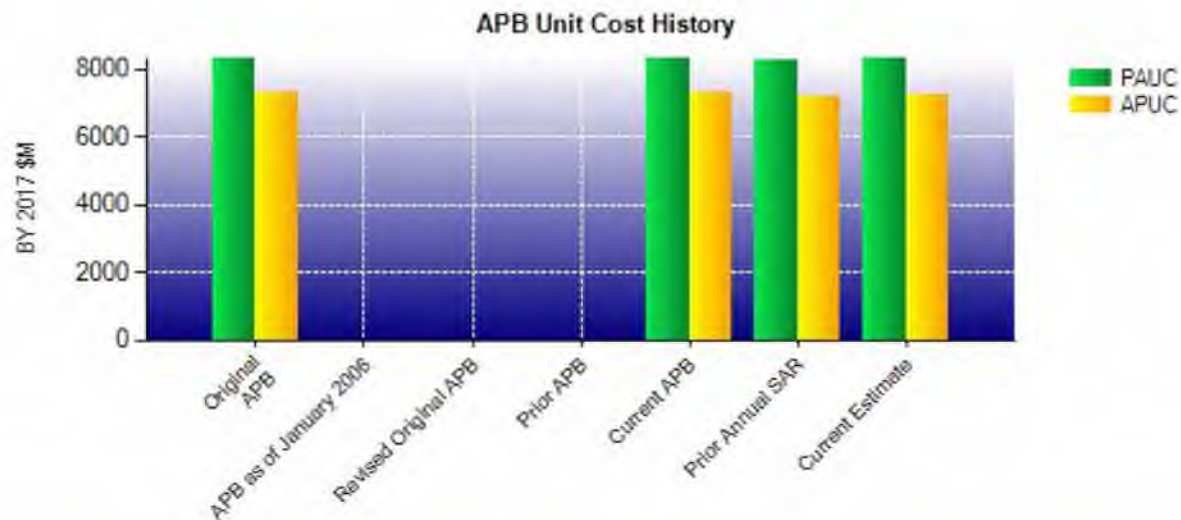
## ~~(U//FOUO)~~ Nuclear Costs

~~(U//FOUO)~~

\$19,140.6 TY\$M. These costs are for reactor propulsion plant equipment. These costs are included in the Shipbuilding and Conversion, Navy costs in this report. Department of Energy costs are excluded from this report.

## Unit Cost

Current UCR Baseline and Current Estimate (Base-Year Dollars)			
Item	BY 2017 \$M	BY 2017 \$M	% Change
	Current UCR Baseline (Jan 2017 APB)	Current Estimate (Dec 2017 SAR)	
Program Acquisition Unit Cost			
Cost	100221.9	99842.2	
Quantity	12	12	
Unit Cost	8351.825	8320.183	-0.38
Average Procurement Unit Cost			
Cost	87426.5	87018.7	
Quantity	12	12	
Unit Cost	7285.542	7251.558	-0.47
Original UCR Baseline and Current Estimate (Base-Year Dollars)			
Item	BY 2017 \$M	BY 2017 \$M	% Change
	Original UCR Baseline (Jan 2017 APB)	Current Estimate (Dec 2017 SAR)	
Program Acquisition Unit Cost			
Cost	100221.9	99842.2	
Quantity	12	12	
Unit Cost	8351.825	8320.183	-0.38
Average Procurement Unit Cost			
Cost	87426.5	87018.7	
Quantity	12	12	
Unit Cost	7285.542	7251.558	-0.47



APB Unit Cost History					
Item	Date	BY 2017 \$M		TY \$M	
		PAUC	APUC	PAUC	APUC
Original APB	Jan 2017	8351.825	7285.542	10686.500	9587.025
APB as of January 2006	N/A	N/A	N/A	N/A	N/A
Revised Original APB	N/A	N/A	N/A	N/A	N/A
Prior APB	N/A	N/A	N/A	N/A	N/A
Current APB	Jan 2017	8351.825	7285.542	10686.500	9587.025
Prior Annual SAR	Dec 2016	8274.375	7206.875	10586.367	9485.992
Current Estimate	Dec 2017	8320.183	7251.558	10572.900	9472.300

### SAR Unit Cost History

Current SAR Baseline to Current Estimate (TY \$M)									
PAUC Development Estimate	Changes								PAUC Current Estimate
	Econ	Qty	Sch	Eng	Est	Oth	Spt	Total	
10686.500	-39.033	0.000	0.000	0.000	-75.742	0.000	1.175	-113.600	10572.900

Current SAR Baseline to Current Estimate (TY \$M)									
Initial APUC Development Estimate	Changes								APUC Current Estimate
	Econ	Qty	Sch	Eng	Est	Oth	Spt	Total	
9587.025	-38.042	0.000	0.000	0.000	-77.858	0.000	1.175	-114.725	9472.300



SAR Baseline History				
Item	SAR Planning Estimate	SAR Development Estimate	SAR Production Estimate	Current Estimate
Milestone A	N/A	Dec 2010	N/A	Dec 2010
Milestone B	N/A	Nov 2016	N/A	Nov 2016
Milestone C	N/A	N/A	N/A	N/A
IOC	N/A	Apr 2030	N/A	Oct 2030
Total Cost (TY \$M)	N/A	128238.0	N/A	126874.8
Total Quantity	N/A	12	N/A	12
PAUC	N/A	10686.500	N/A	10572.900

**Cost Variance**

Summary TY \$M				
Item	RDT&E	Procurement	MILCON	Total
SAR Baseline (Development Estimate)	13020.3	115044.3	173.4	128238.0
Previous Changes				
Economic	+11.6	+432.7	+1.9	+446.2
Quantity	--	--	--	--
Schedule	--	--	--	--
Engineering	--	--	--	--
Estimating	-11.6	-1640.0	+8.9	-1642.7
Other	--	--	--	--
Support	--	-5.1	--	-5.1
Subtotal	--	-1212.4	+10.8	-1201.6
Current Changes				
Economic	-24.0	-889.2	-1.4	-914.6
Quantity	--	--	--	--
Schedule	--	--	--	--
Engineering	--	--	--	--
Estimating	+24.0	+705.7	+4.1	+733.8
Other	--	--	--	--
Support	--	+19.2	--	+19.2
Subtotal	--	-164.3	+2.7	-161.6
Total Changes	--	-1376.7	+13.5	-1363.2
Current Estimate	13020.3	113667.6	186.9	126874.8

Summary BY 2017 \$M				
Item	RDT&E	Procurement	MILCON	Total
SAR Baseline (Development Estimate)	12648.1	87426.5	147.3	100221.9
Previous Changes				
Economic	--	--	--	--
Quantity	--	--	--	--
Schedule	--	--	--	--
Engineering	--	--	--	--
Estimating	+6.5	-940.1	+8.1	-925.5
Other	--	--	--	--
Support	--	-3.9	--	-3.9
Subtotal	+6.5	-944.0	+8.1	-929.4
Current Changes				
Economic	--	--	--	--
Quantity	--	--	--	--
Schedule	--	--	--	--
Engineering	--	--	--	--
Estimating	+11.2	+521.6	+2.3	+535.1
Other	--	--	--	--
Support	--	+14.6	--	+14.6
Subtotal	+11.2	+536.2	+2.3	+549.7
Total Changes	+17.7	-407.8	+10.4	-379.7
Current Estimate	12665.8	87018.7	157.7	99842.2

Previous Estimate: December 2016



RDT&E	\$M	
Current Change Explanations	Base Year	Then Year
Revised escalation indices. (Economic)	N/A	-24.0
Revised estimate to incorporate updated escalation assumptions (Navy). (Estimating)	-9.6	0.0
Revised estimate to reflect application of new outyear escalation indices (Navy). (Estimating)	+30.5	+34.4
Revised estimate reflects updated Department-wide adjustment (Navy). (Estimating)	-10.2	-11.2
Adjustment for current and prior escalation. (Estimating)	+0.5	+0.8
RDT&E Subtotal	+11.2	0.0

Procurement	\$M	
Current Change Explanations	Base Year	Then Year
Revised escalation indices. (Economic)	N/A	-889.2
Revised estimates reflect updated Department-wide adjustment (SCN). (Estimating)	-97.6	-111.0
Revised estimate to reflect application of new outyear indices (SCN). (Estimating)	+655.3	+858.9
Revised estimate to incorporate updated escalation assumptions (SCN). (Estimating)	-46.5	-53.2
Adjustment for current and prior escalation. (Estimating)	+10.4	+11.0
Increase in Other Support to reflect application of new outyear escalation indices (SCN). (Support)	+3.6	+5.1
Increase in Other Support to reflect application of new outyear escalation indices (OPN). (Support)	+11.0	+14.1
Procurement Subtotal	+536.2	-164.3

MILCON	\$M	
Current Change Explanations	Base Year	Then Year
Revised escalation indices. (Economic)	N/A	-1.4
Revised estimate for Naval Foundry and Propeller Center requirements. (Estimating)	+1.3	+1.4
Revised estimate to reflect updated COLUMBIA requirements. (Estimating)	-0.1	+1.3
Revised estimate to reflect application of new outyear indices. (Estimating)	+1.0	+1.3
Adjustment for current and prior escalation. (Estimating)	+0.1	+0.1
MILCON Subtotal	+2.3	+2.7



**(U//FOUO) Contracts****Contract Identification**

**Appropriation:** RDT&E  
**Contract Name:** OR DESIGN CLIN 1000  
**Contractor:** General Dynamics - Electric Boat  
**Contractor Location:** 75 EASTERN POINT RD  
 Groton, CT 06340  
**Contract Number:** N00024-13-C-2128/1  
**Contract Type:** Cost Plus Fixed Fee (CPFF)  
**Award Date:** December 21, 2012  
**Definitization Date:** December 21, 2012

**Contract Price**

Initial Contract Price (\$M)			Current Contract Price (\$M)			Estimated Price At Completion (\$M)	
Target	Ceiling	Qty	Target	Ceiling	Qty	Contractor	Program Manager
732.2	N/A	N/A	764.9	N/A	N/A	764.9	764.9

**Target Price Change Explanation**

The difference between the Initial Contract Price Target and the Current Contract Price Target is due to the Navy's modification of this vehicle to execute detailed design efforts during IPPD Contract negotiations.

**Cost and Schedule Variance Explanations**

Cost and Schedule Variance reporting is not required on this (CPFF) contract.

**General Contract Variance Explanation**

Cost and schedule variances are not reported for this contract, because the work associated with this CLIN is Level of Effort (LOE)

**Notes**

This contract is more than 90% complete; therefore, this is the final report for this contract.

**Contract Identification**

**Appropriation:** RDT&E  
**Contract Name:** OR DESIGN SUPPORT ACTIVITIES CLIN 2000  
**Contractor:** General Dynamics - Electric Boat  
**Contractor Location:** 75 EASTERN POINT RD  
 Groton, CT 06340  
**Contract Number:** N00024-13-C-2128/2  
**Contract Type:** Cost Plus Fixed Fee (CPFF)  
**Award Date:** December 21, 2012  
**Definitization Date:** December 21, 2012

**Contract Price**

Initial Contract Price (\$M)			Current Contract Price (\$M)			Estimated Price At Completion (\$M)	
Target	Ceiling	Qty	Target	Ceiling	Qty	Contractor	Program Manager
690.5	N/A	N/A	827.5	N/A	N/A	827.5	827.5

**Target Price Change Explanation**

The difference between the Initial Contract Price Target and the Current Contract Price Target is due to Navy exercised previously-negotiated contract ceiling on contract N00024-13-C-2128 which was transferred from an unexercised level-of-effort option CLIN (CLIN 3000). Both CLINs are for design, engineering and prototyping work in support of the COLUMBIA class submarine program.

**Cost and Schedule Variance Explanations**

Cost and Schedule Variance reporting is not required on this (CPFF) contract.

**General Contract Variance Explanation**

Cost and schedule variances are not reported for this contract, because the work associated with this CLIN is Level of Effort (LOE)

**Notes**

This contract is more than 90% complete; therefore, this is the final report for this contract.



**Contract Identification**

**Appropriation:** RDT&E  
**Contract Name:** OR COMPONENT DEVELOPMENT CLIN 2050  
**Contractor:** General Dynamics - Electric Boat  
**Contractor Location:** 75 EASTERN POINT RD  
 Groton, CT 06340  
**Contract Number:** N00024-13-C-2128/3  
**Contract Type:** Cost Plus Fixed Fee (CPFF)  
**Award Date:** December 21, 2012  
**Definitization Date:** December 21, 2012

**Contract Price**

Initial Contract Price (\$M)			Current Contract Price (\$M)			Estimated Price At Completion (\$M)	
Target	Ceiling	Qty	Target	Ceiling	Qty	Contractor	Program Manager
140.6	N/A	N/A	150.3	N/A	N/A	150.3	150.3

**Target Price Change Explanation**

The difference between the Initial Contract Price Target and the Current Contract Price Target is due to Navy exercised previously-negotiated contract ceiling on contract N00024-13-C-2128 which was transferred from an unexercised level-of-effort option CLIN (CLIN 3000). Both CLINs are for design, engineering and prototyping work in support of the COLUMBIA class submarine program.

**Cost and Schedule Variance Explanations**

Cost and Schedule Variance reporting is not required on this (CPFF) contract.

**General Contract Variance Explanation**

Cost and schedule variances are not reported for this contract, because the work associated with this CLIN is Level of Effort (LOE)

**Notes**

This contract is more than 90% complete; therefore, this is the final report for this contract.

**(U//FOUO) Contract Identification**

**Appropriation:** Procurement  
**Contract Name:** IPPD Design Completion  
**Contractor:** General Dynamics  
**Contractor Location:** 75 Eastern Point Road  
 Groton, CT 06340  
**Contract Number:** N00024-17-C-2117/1  
**Contract Type:** Cost Plus Incentive Fee (CPIF)  
**Award Date:** September 21, 2017  
**Definitization Date:** September 21, 2017

**Contract Price**

Initial Contract Price (\$M)			Current Contract Price (\$M)			Estimated Price At Completion (\$M)	
Target	Ceiling	Qty	Target	Ceiling	Qty	Contractor	Program Manager
3028.9	N/A	N/A	3028.9	N/A	N/A		3028.9

**Cost and Schedule Variance Explanations**

Cost and Schedule Variance reporting is not required on this (CPIF) contract.

**General Contract Variance Explanation**

Cost and Schedule Variance reporting will start in March 2018.

**Contract Identification**

**Appropriation:** RDT&E  
**Contract Name:** IPPD MTM and Reactor Compartment Bulkhead Prototype Manufacturing  
**Contractor:** General Dynamics  
**Contractor Location:** 75 Eastern Point Rd  
 Groton, CT 06340  
**Contract Number:** N00024-17-C-2117/2  
**Contract Type:** Cost Plus Fixed Fee (CPFF)  
**Award Date:** September 21, 2017  
**Definitization Date:** September 21, 2017

**Contract Price**

Initial Contract Price (\$M)			Current Contract Price (\$M)			Estimated Price At Completion (\$M)	
Target	Ceiling	Qty	Target	Ceiling	Qty	Contractor	Program Manager
391.2	N/A	N/A	391.2	N/A	N/A		391.2

**Cost and Schedule Variance Explanations**

Cost and Schedule Variance reporting is not required on this (CPFF) contract.

**General Contract Variance Explanation**

Cost and schedule variances are not reported for this contract, because the work associated with this CLIN is Level of Effort (LOE)

**Notes**

This contract is funded with both RDT&E, Navy and Shipbuilding and Conversion, Navy appropriations.



**Contract Identification**

**Appropriation:** RDT&E  
**Contract Name:** IPPD COLUMBIA Component Development and DFA  
**Contractor:** General Dynamics  
**Contractor Location:** 75 Eastern Point Rd  
Groton, CT 06340  
**Contract Number:** N00024-17-C-2117/3  
**Contract Type:** Cost Plus Fixed Fee (CPFF)  
**Award Date:** September 21, 2017  
**Definitization Date:** September 21, 2017

**Contract Price**

Initial Contract Price (\$M)			Current Contract Price (\$M)			Estimated Price At Completion (\$M)	
Target	Ceiling	Qty	Target	Ceiling	Qty	Contractor	Program Manager
682.7	N/A	N/A	682.7	N/A	N/A		682.7

**Cost and Schedule Variance Explanations**

Cost and Schedule Variance reporting is not required on this (CPFF) contract.

**General Contract Variance Explanation**

Cost and schedule variances are not reported for this contract, because the work associated with this CLIN is Level of Effort (LOE)

**Notes**

This contract is funded with both RDT&E, Navy and Shipbuilding and Conversion, Navy appropriations.

## Deliveries and Expenditures

Deliveries				
Delivered to Date	Planned to Date	Actual to Date	Total Quantity	Percent Delivered
Development	0	0	0	--
Production	0	0	12	0.00%
Total Program Quantity Delivered	0	0	12	0.00%

Expended and Appropriated (TY \$M)			
Total Acquisition Cost	126874.8	Years Appropriated	11
Expended to Date	8146.4	Percent Years Appropriated	31.43%
Percent Expended	6.42%	Appropriated to Date	10617.4
Total Funding Years	35	Percent Appropriated	8.37%

The above data is current as of February 12, 2018.

## Operating and Support Cost

### Cost Estimate Details

Date of Estimate:	September 26, 2016
Source of Estimate:	SCP
Quantity to Sustain:	12
Unit of Measure:	Ship
Service Life per Unit:	42.50 Years
Fiscal Years in Service:	FY 2031 - FY 2084

### Sustainment Strategy

The SSBN 826 COLUMBIA Class Submarine will operate with two crews (Blue/Gold) in two oceans under current strategic presence requirements from existing bases in Bangor, WA and Kings Bay, GA. The COLUMBIA Class Submarine SSBN will have an approximately 42.5-year service life from delivery to retirement, with the following life cycle as described below:

- Sea Trials that include Alpha/Bravo Trials and Board of Inspection and Survey
- Operational and Development test period (lead ship only)
- Two operating cycles during which the ship will conduct about 124 operating intervals
- Two Extended Refit Periods (ERPs) of about 6 months at its one-quarter and three quarter periods of life
- An extended shipyard maintenance period not to exceed 24 months at mid-life, consisting of 16 months for Engineered Overhaul (EOH) and 7 months for weapons handling operations and crew certification

Each 112 day operating interval includes:

- 77-day patrol
- 35-day refit and resupply period consisting of 22 days for refit production

Approximately every fourth refit and resupply period will be 50 days in duration including 35 days of refit production and dry-docking. The patrol period following a dry-docking refit will normally be shortened to keep the overall operating interval to about 112 days. All availabilities including ERPs will be conducted at the respective homeport and EOH will be conducted at either Norfolk Naval Shipyard (NNSY) or Puget Sound Naval Shipyard (PSNSY). Additionally, COLUMBIA will leverage OHIO existing infrastructure to the maximum extent possible.

Achieving this life cycle is the foundation of the product support model for the COLUMBIA Class Submarine Program and all support elements must be aligned to support the life cycle as described. The COLUMBIA Class Submarine life cycle is essentially the same as the current OHIO Class SSBN life cycle with the exception of the mid-life overhaul which will be shorter for COLUMBIA Class Submarines because refueling will not be required. The support model needed for the SSBN life cycle is well understood and being exercised today in support of the OHIO Class. The design of COLUMBIA Class Submarine and its product support strategy must be capable of meeting this life cycle in order to meet its availability requirements.

### Antecedent Information



The Antecedent System is the SSBN 726 OHIO Class Submarine. The ship's O&S estimate is based on a Blue/Gold manning philosophy analogous to the OHIO Class manning structure, current maintenance and modernization requirements, and historical submarine data. There are currently 14 OHIO Class Submarines.

Annual O&S Costs BY2017 \$M			
Cost Element	SSBN 826 Average Annual Cost Per Ship		SSBN 726 (Antecedent) Average Annual Cost Per Ship
Unit-Level Manpower	29.591		30.843
Unit Operations	1.826		1.826
Maintenance	29.253		35.829
Sustaining Support	5.478		4.598
Continuing System Improvements	33.782		22.518
Indirect Support	15.699		16.010
Other	--		--
Total	115.629		111.624

Item	Total O&S Cost \$M			
	SSBN 826			SSBN 726 (Antecedent)
	Current Development APB Objective/Threshold	Current Estimate		
Base Year	60574.4	66631.8	58970.7	66416.0
Then Year	138910.5	N/A	133376.9	N/A

Disposal Cost is included in the Operating and Support Cost of the current APB objective and threshold for this program.

#### Equation to Translate Annual Cost to Total Cost

Total Ship O&S = unitized cost \* number of ships \* service life per ship

Total Ship O&S = \$115.629M/ship/year \* 12 ships \* 42.5 years = \$58970.79M

O&S Cost Variance		
Category	BY 2017 \$M	Change Explanations
Prior SAR Total O&S Estimates - Dec 2016 SAR	58970.7	
Programmatic/Planning Factors	0.0	
Cost Estimating Methodology	0.0	
Cost Data Update	0.0	
Labor Rate	0.0	
Energy Rate	0.0	
Technical Input	0.0	
Other	0.0	
Total Changes	0.0	
Current Estimate	58970.7	



**Disposal Estimate Details**

Date of Estimate:	September 26, 2016
Source of Estimate:	SCP
Disposal/Demilitarization Total Cost (BY 2017 \$M):	Total costs for disposal of all Ship are 1603.7